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REPORT ON EXPERIMENT CONDUCTED ON LAKE TANGANYIKA, APRIL 1969.(U)
MAY 69 E N JONES, A L BROOKS

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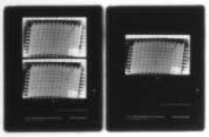

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U. S. NAVY UNDERWATER SOUND LABORATORY
FORT TRUMBULL, NEW LONDON, CONNECTICUT

(6) REPORT ON EXPERIMENT CONDUCTED ON LAKE TANGANYIKA, APRIL 1969

by

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(9) (14) USL-TM-
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INTRODUCTION

A series of hydrological and biological tests were conducted on Lake Tanganyika to examine the effects of 1.8 pound TNT explosive sound signals on the commercial fishery found there. The evaluation of the explosive effects was a preliminary requirement for the sound propagation exercise to be undertaken at a later date which would use about 200 charges of the same type. Two requirements would have to be met in order that permission for the sound propagation exercise be sanctioned. They were; 1. that the detonation of a Mark 61 explosive at 350 feet would not cause significant mixing of the underlying waters with the fish-inhabited waters, and 2. that such an explosion would not kill a significant number of fish. A secondary purpose of the experiment was to obtain bathythermographic (BT) casts along the track intended for the sound propagation exercise.

PROCEDURE

In order to satisfy the primary purpose of the experiment it was decided after a consultation between Underwater Sound Laboratory personnel and the scientific advisor to the Congolese government, Professor J.J. Symoens, to perform a series of Nansen casts before and at 6 hour intervals after the detonation of the explosive. A point about 15 miles

southeast of Kalemie where the depth was over 500m. was chosen as station 1. Dissolved hydrogen sulfide and oxygen would then be determined at each discrete sampling level. BT casts would be taken prior to the Nansen casts at 6 hour intervals. In this way the degree of mixing due to the explosion could be determined. Fish-kill would be evaluated at another station (station 2) during daylight hours by detonating two charges simultaneously and observing the surface in the vicinity of the explosion for floating dead fish. A vertical plankton haul was included to evaluate plankton concentrations before and after the explosion.

RESULTS

Four Nansen casts were made to a depth of 140m. The corrected reversing thermometer readings and hydrogen sulfide titration values are given in the following tables. BT casts accompanying the Nansen casts (numbers 1-3) are shown on photostats.

Unfortunately, hydrogen sulfide concentrations at station 1 were negligibly small, even at the greatest depths sampled. In most cases iodine titrations gave the same apparent hydrogen sulfide concentration as the blank (distilled or surface water), in effect, a negative test. The only conclusion to be drawn from the hydrogen sulfide test was that no measurable quantity of hydrogen sulfide exists in the water samples before or after the explosion.

Dissolved oxygen values and results of plankton tows are being reported on separately by Professor Symoens.

No dead fish were observed floating on the surface 1¼ hours after the explosion of two Mark 61 charges. The observers concluded that the blast had an insignificant effect on fish species in the lake.

BT casts made at one hour intervals while proceeding south from station 2 are shown on photostats (numbers 6-13). The last BT station (station 10) was approximately 10 miles east of the town of Moba. All positions were determined by dead reckoning and sightings of landmarks.

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Biologist

Everett N. Jones
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TABLE I: LAKE TANGANYIKA NANSEN CAST

Cast: 1 Date: 23 April, 1969 Time: 1530 L (prior to explosion)

Position: Approx. 20 miles SE of Kalemie Station 1

Nansen bottle #	Depth of water sample, m	Temperature reading °C	Temperature corrected	H_2S Test ml 1.10×10^{-3} N iodine to neut. 100 ml sample
10	140	23.78 23.79	23.79 23.77	1.35
9	125	23.88 23.85	23.86 23.84	1.40
8	110	23.89 23.89	23.91 23.91	1.40
7	100	23.98 24.00	24.02 24.00	1.40
6	95	flooded 24.68	24.67	
5	85	24.51 24.14	24.51 24.14	
4	70	24.41 24.49	24.45 24.48	1.35
2	45	26.71	26.72	1.40
1	20	26.77	26.76	1.40
		titration blank: 100 ml surface water		1.40

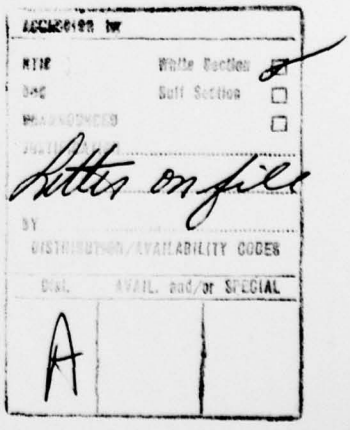

TABLE II: LAKE TANGANYIKA NANSEN CAST

Cast: 2 Date: 23 April, 1969 Time: 2020 L

Position: station 1

Nansen bottle #	Depth of water sample, m	Temperature °C reading	Temperature °C corrected	H_2S Test ml 1.10×10^{-3}N I_2 to neut. 100 ml sample
5	85	24.12 24.12	24.12 24.12	1.50
4	70	24.46 24.50	24.50 24.49	1.50
2	45	26.70	24.71	1.40
1	20	26.73	26.72	1.50
titration blank: 100 ml distilled water				1.50

Note: Time of first explosion is 1830, 23 April

Nansen bottles #10, #7 were not actuated by messenger. Nansen bottles #9 and #8 were lost.

TABLE III: LAKE TANGANYIKA NANSEN CAST

Cast: 3 Date: 24 April, 1969 Time: 0020 L

Position: station 1

Nansen Bottle #	Depth of water sample, m	Temperature °C reading	Temperature °C corrected	H_2S Test ml 1.10×10^{-3}N I_2 to neut. 100 ml sample
10	140	23.75 23.80	23.76 23.78	1.60
6	125	23.88 23.82	23.84 23.81	1.60
1	110	23.92	23.91	1.50
7	100	23.99 24.00	24.03 24.00	1.60
5	85	24.12 24.11	24.12 24.11	1.55
4	70	24.49 24.51	24.53 24.50	1.60
2	45	26.70	26.71	1.50
	titration blank: 100 ml surface water			1.55

TABLE IV: LAKE TANGANYIKA NANSEN CAST

Cast: 4 Date: 24 April, 1969 Time: 0728 L

Position: vicinity of station 1

Nansen bottle #	Depth of water sample, m	Temperature °C reading	Temperature °C corrected	ml 1.10×10^{-3}N I_2 to neut. 100 ml sample
7	100	23.98 24.00	24.02 24.00	1.60
5	85	24.15 24.16	24.15 24.16	1.60
4	70	24.44 24.50	24.48 24.49	1.55
2	45	26.73	26.74	1.60
titration blank: 100 ml surface water				1.60

Notes: Nansen bottles #10, #6, and #1 were not actuated by messenger.

Observed wire angle cast 4: about 2° (no depth compensation has been made).

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BATHYTHERMOGRAPHIC RECORD: LAKE TANGANYIKA

BT slide #	Station #	Time	Date April	Surface temp. °F	Position on the Lake
1	1	1500	23	80.0	6° 09' S, 29° 27' E
2	1	1900	23	79.7	" "
3	1	0615	24	79.5	" "
4	2	1000	24	80.1	6° 14' S, 29° 32' E
5	2	1105	24	80.7	6° 14' S, 29° 32' E
6	3	1315	24	81.0	6° 19' S, 29° 35' E
7	4	1415	24	81.0	6° 24' S, 29° 38' E
8	5	1515	24	80.6	6° 29' S, 29° 41' E
9	6	1615	24	80.3	6° 35' S, 29° 44' E
10	7	1715	24	80.0	6° 40' S, 29° 46' E
11	8	1815	24	80.0	6° 45' S, 29° 49' E
12	9	1915	24	80.0	6° 51' S, 29° 51' E
13	10	2015	24	79.7	6° 56' S, 29° 54' E

Notes: Explosion to two charges at station 2; time 1100, 24 Apr. 1969

Depth scale on BT slides in FEET

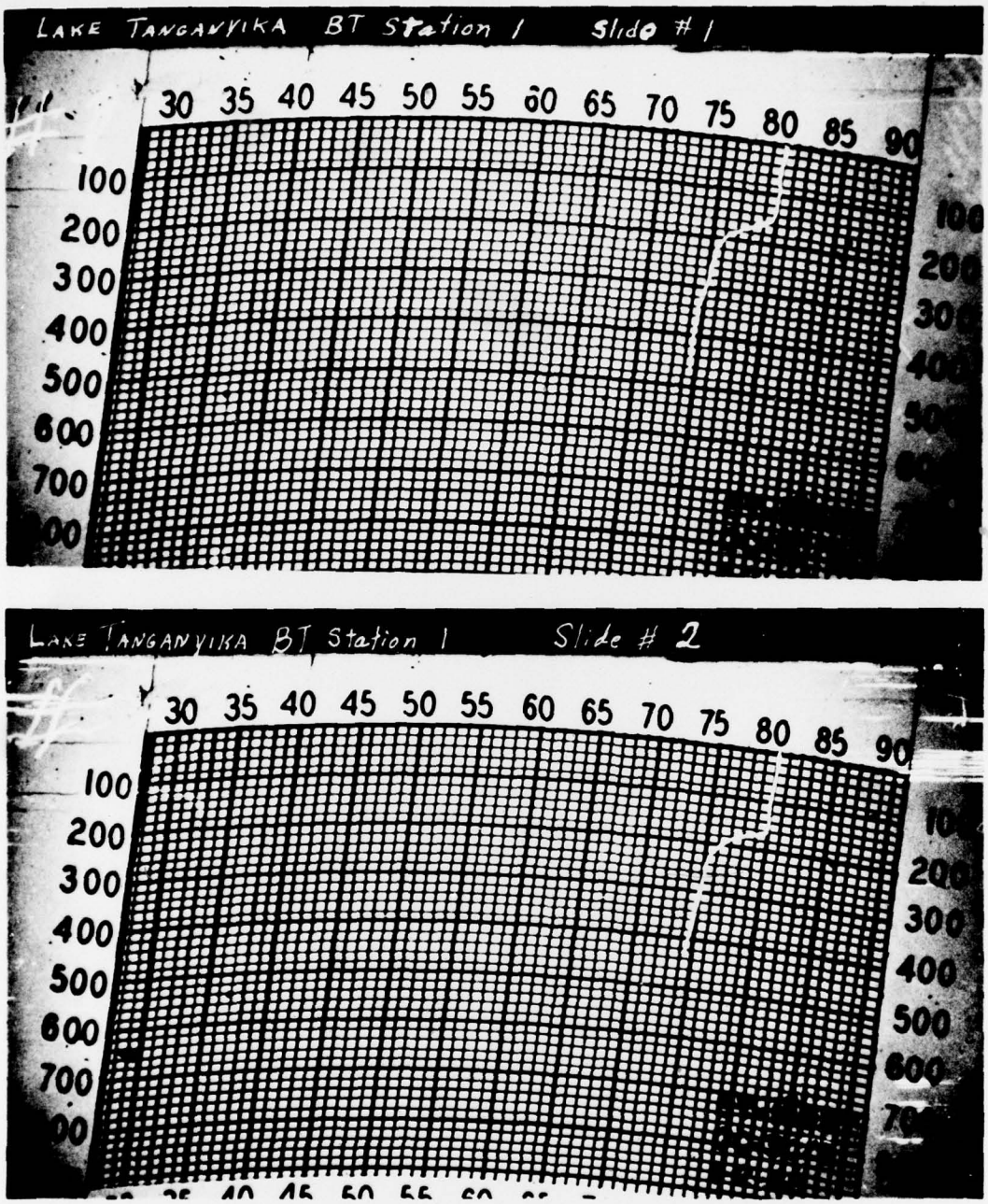

Fig. 1

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U. S. Navy Underwater Sound Laboratory Official Photograph
NP24 - 36113 - 6 - 69

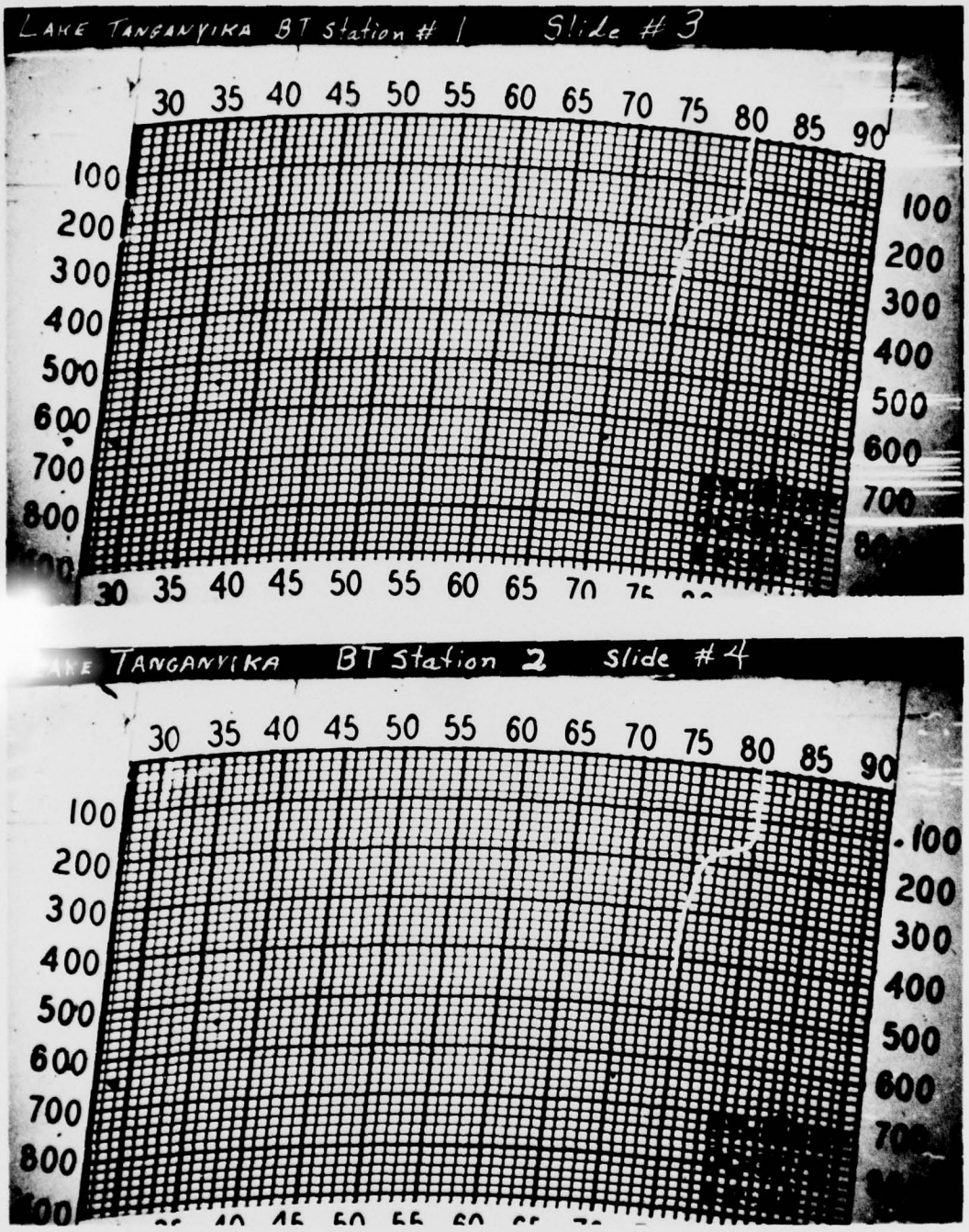

Fig. 2

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U. S. Navy Underwater Sound Laboratory Official Photograph
NP24 - 36114 - 6 - 69

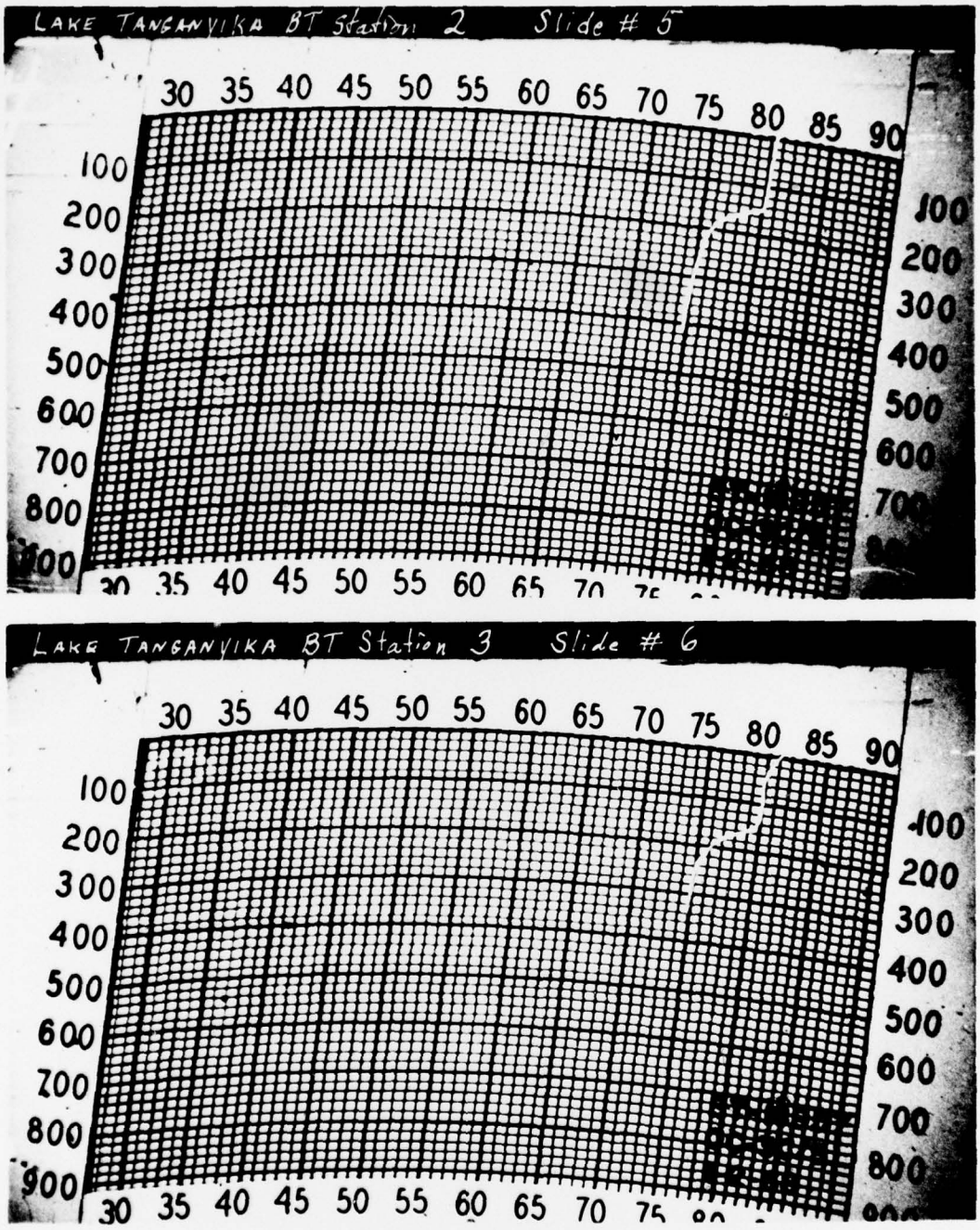

Fig. 3

USL Tech Memo No. 2213-104-69

U. S. Navy Underwater Sound Laboratory Official Photograph
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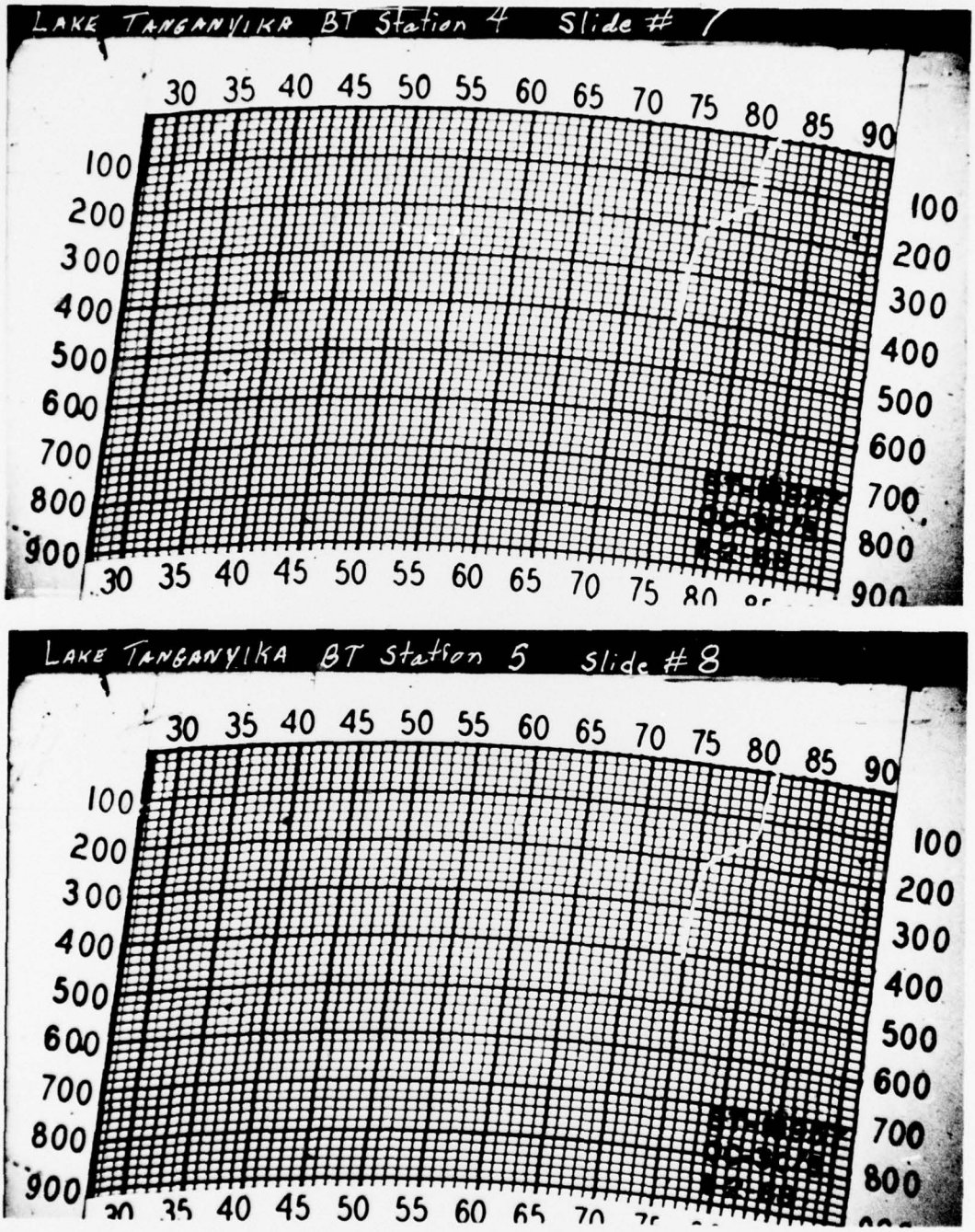

Fig. 4

U. S. Navy Underwater Sound Laboratory
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Official Photograph

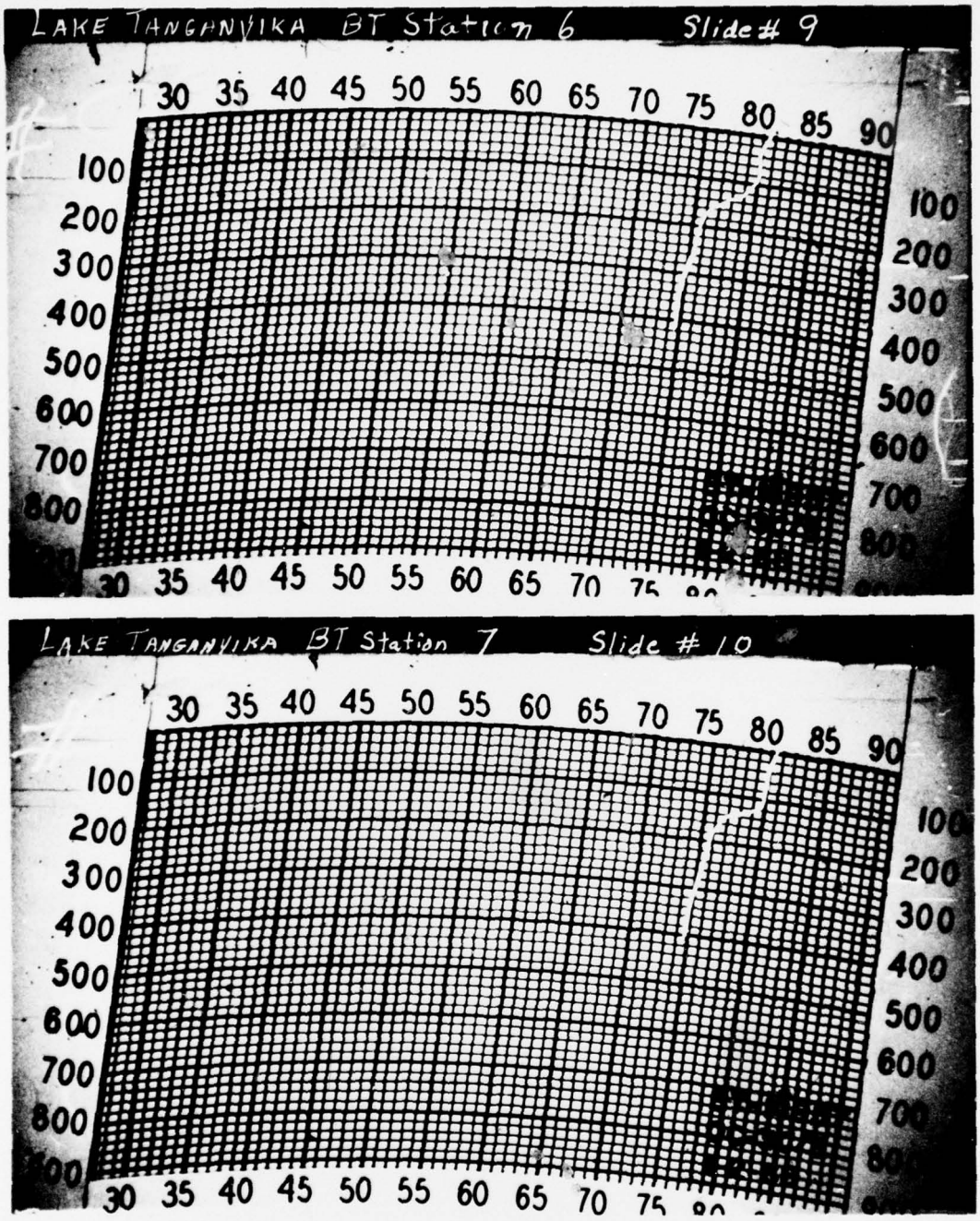

Fig. 5

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U. S. Navy Underwater Sound Laboratory Official Photograph
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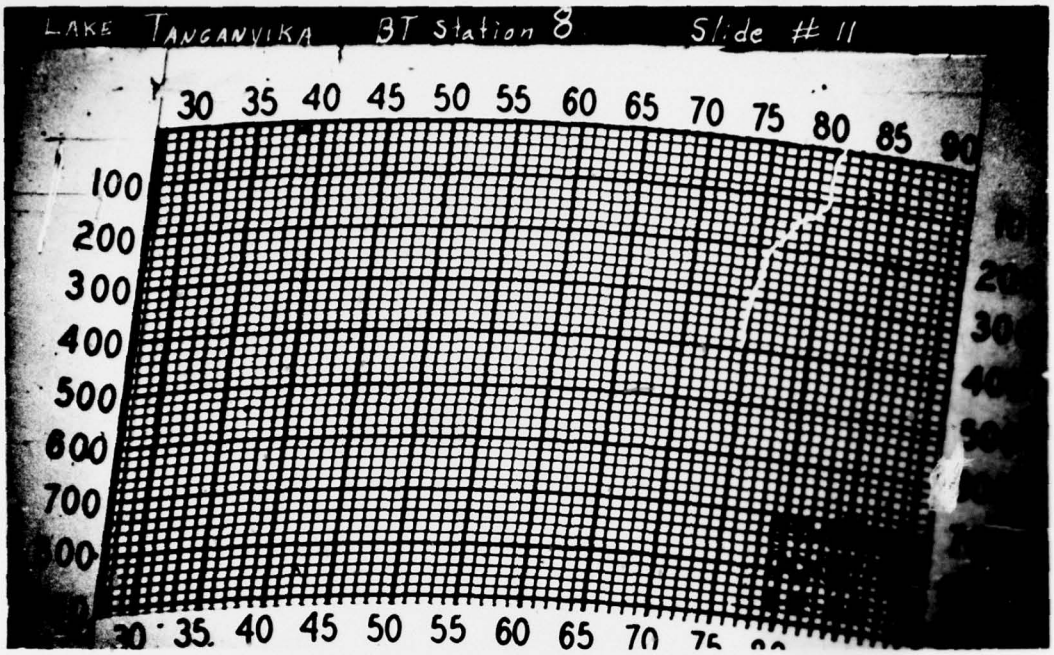

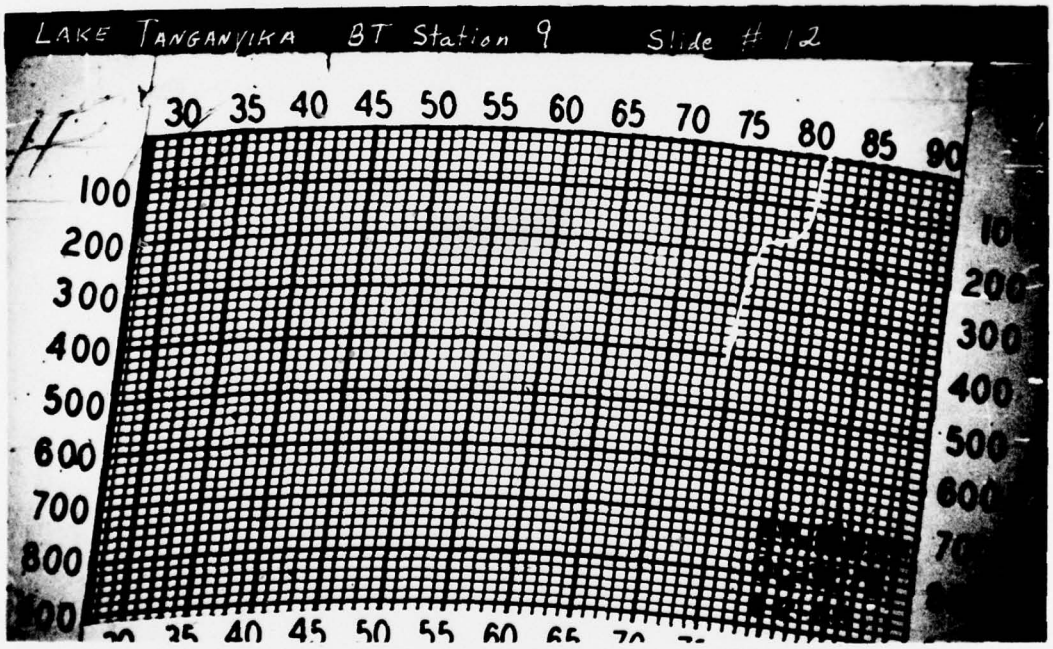

Fig. 6

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U. S. Navy Underwater Sound Laboratory Official Photograph
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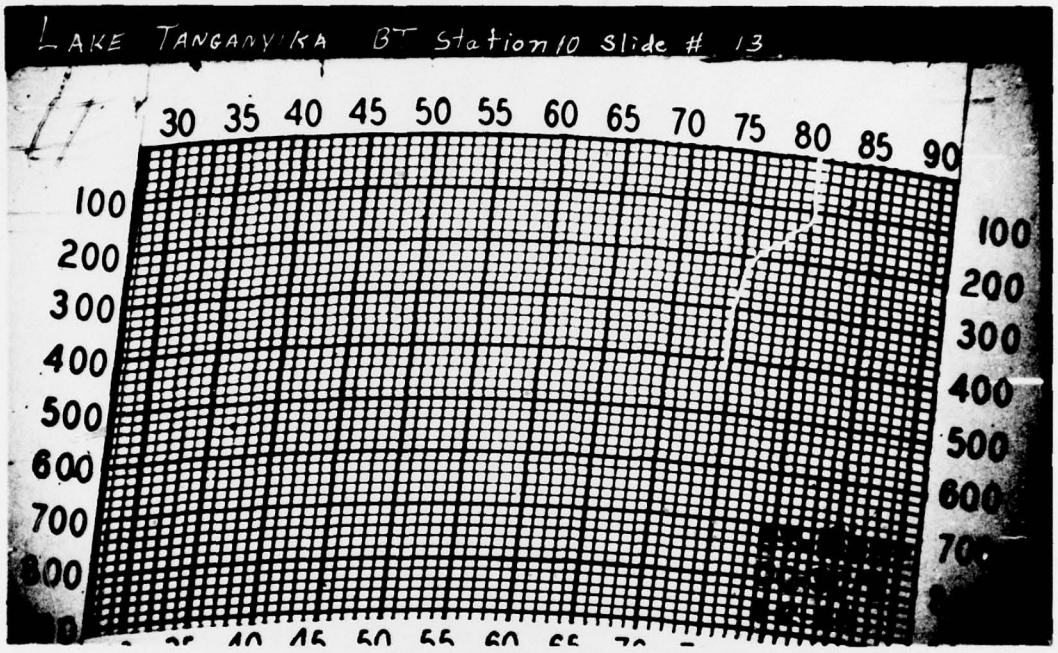

Fig. 7

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U. S. Navy Underwater Sound Laboratory Official Photograph
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